

# Using Blood Tests to Identify Babies and Criminals

Copyright, 2010, by Drs. Jennifer Doherty and Ingrid Waldron, Department of Biology, University of Pennsylvania<sup>1</sup>

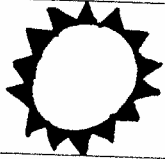
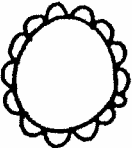
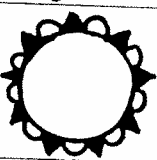
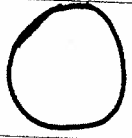
## I. Were the babies switched?

Two couples had babies in the same hospital at the same time. Michael and Danielle had twins, a boy, Michael, Jr., and a girl, Michelle. Denise and Earnest had a girl, Tonja. Danielle was convinced that there had been a mix-up and she had the wrong girl, since Michael Jr. and Tonja were both light-skinned, while Michelle had darker skin. Danielle insisted on blood type tests for both families to check whether there had been a mix-up. In order to interpret the results of the blood type tests, you will need to understand the basic biology of blood types.



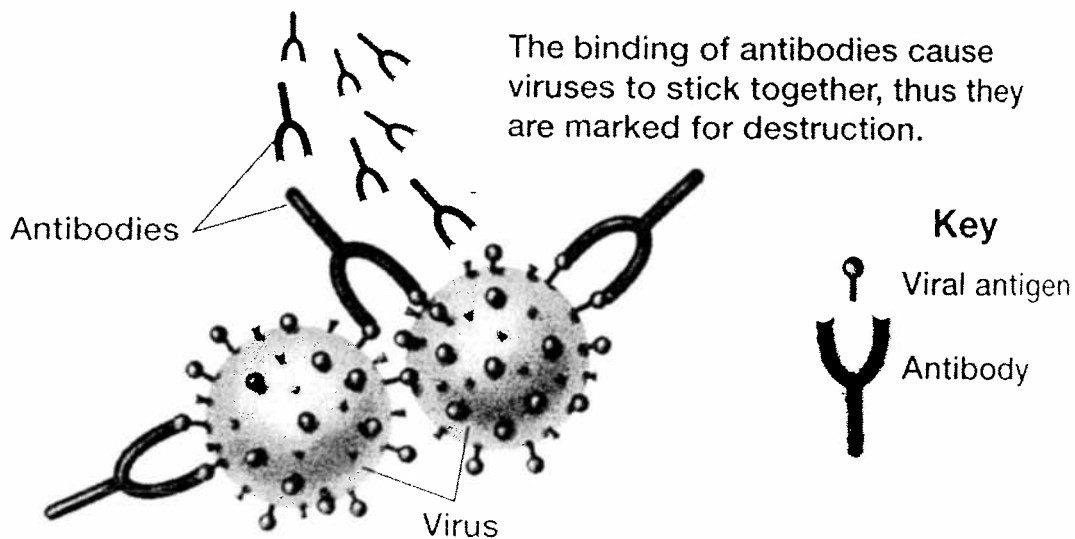
## Blood Types

There are many different ways to classify blood types, but the most common blood type classification system is the ABO (said "A-B-O") system. There are four blood types in the ABO system: Type A, Type B, Type AB, and Type O. These blood types refer to different versions of carbohydrate molecules (complex sugars) which are present on the surface of red blood cells.

People with:	Have:
Type A blood	Type A carbohydrate molecules on their red blood cells 
Type B blood	Type B carbohydrate molecules on their red blood cells 
Type AB blood	Type A and B carbohydrate molecules on their red blood cells 
Type O blood	Neither A nor B carbohydrate molecules on their red blood cells 

The Type A and Type B carbohydrate molecules are called **antigens** because they can stimulate the body to produce an immune response, including antibodies. **Antibodies** are special proteins that travel in the blood and help our bodies to destroy viruses or bacteria that may have infected our bodies (see figure on next page).

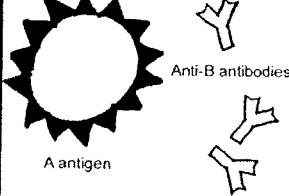
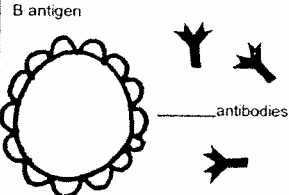
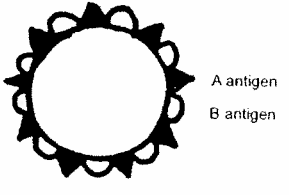
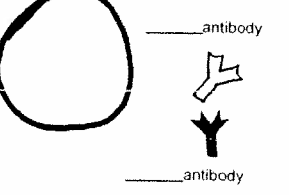
<sup>1</sup> Teachers are encouraged to copy this student handout for classroom use. A Word file (which can be used to prepare a modified version if desired), Teacher Preparation Notes, comments, and the complete list of our hands-on activities are available at [http://serendip.brynmawr.edu/sci\\_edu/waldron/](http://serendip.brynmawr.edu/sci_edu/waldron/).



Adapted from Figure 40.5 in *Holt Biology* by Johnson and Raven

Normally, our bodies do not make antibodies against any molecules that are part of our own bodies. Thus, antibodies help to defend against invading viruses and bacteria, but normally antibodies do not attack our own body cells.

For example, people with Type A blood do not make antibodies against the Type A antigen which is present on their red blood cells, but they do make antibodies against the Type B antigen. Test your understanding of blood groups by filling in the blanks in the chart below.

 <p>A antigen</p> <p>Anti-B antibodies</p>	<p><b>Blood group A</b>          If you belong to the blood group A, you have A antigens on the surface of your red blood cells and _____ antibodies in your blood.</p>
 <p>B antigen</p> <p>_____ antibodies</p>	<p><b>Blood group B</b>          If you belong to the blood group B, you have B antigens on the surface of your red blood cells and _____ antibodies in your blood.</p>
 <p>A antigen</p> <p>B antigen</p>	<p><b>Blood group AB</b>          If you belong to the blood group AB, you have both A and B antigens on the surface of your red blood cells and no anti-A or anti-B antibodies in your blood.</p>
 <p>_____ antibody</p> <p>_____ antibody</p>	<p><b>Blood group O</b>          If you belong to the blood group O, you have neither A nor B antigens on the surface of your red blood cells, but you have both _____ and _____ antibodies in your blood.</p>